IAHR YPN Baden-Württemberg
21st Annual Colloquium

Sustainable Water Management:
Challenges for the Next Generation

4th November, 2022

SimTech Building
Pfaffenwaldring 5a, 70569, Universität Stuttgart

IAHR YPN Young Professionals Network
Hosted by Spain Water and IWHR, China

University of Stuttgart
Germany

Welcome Note

from IAHR-YPN BW

The IAHR-BW YPN Committee would like to welcome you to the 21st edition of the IAHR Annual Colloquium. As a Young Professional Network, our goal is to promote the exchange of expertise and tools among students and professionals in the water sector. In order to achieve this, one of the major projects is the Annual Colloquium, where you have the opportunity to connect with water professionals and take part in discussions with renowned researchers.

Climate change, population growth, increasing water scarcity and ecological degradation are putting ever increasing pressure on our infrastructure. This year's edition has turned its attention to these challenges that we will need to face in the coming years, hence the theme of "*Sustainable Water Management: Challenges for the Next Generation*". We thank you for your participation in our annual colloquium and we hope the knowledge you gain will help you to face any future challenges head on.

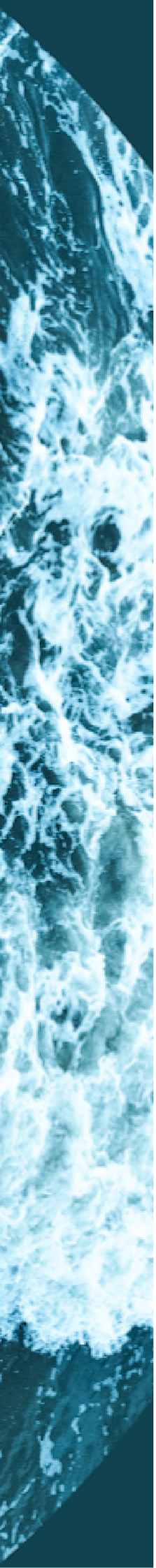
The IAHR-YPN BW Comittee

IAHR YPN Baden-Württemberg
21st Annual Colloquium

Sustainable Water Management:
Challenges for the Next Generation

Schedule

9:30 - 9:45	Signup
10:15 - 10:25	Young Professional Forum Opening Ceremony
10:25 - 10:50	Manuel Alvarez Chaves
10:50 - 11:15	Eduardo Acuna
11:15 - 11:30	Coffee Break
11:30 - 11:55	Sarah Quynh-Giang Ho
11:55 - 12:20	Dan Trinh Cong
12:20 - 12:45	Michele Trevisson
12:45 - 14:10	Lunch Break
14:10 - 14:20	Professional Forum Opening Ceremony
14:20 - 15:00	Dr.-Ing. Ulrike Scherer
15:00 - 15:40	Mr. Philipp Thumser
15:40 - 16:20	Coffee Break
16:20 - 17:00	Prof. Dr. Mário Franca
17:00 - 17:40	Dr.-Ing. Rüdiger Siebel
17:40 - 18:00	Closing Ceremony
18:00 - 20:20	Dinner



Young Professional's Forum

10:25 - 10:50 **Manuel Alvarez Chaves**

Hybrid Rainfall-Runoff Models

10:50 - 11:15 **Eduardo Acuña**

Stochastic Calibration of Sediment Transport Models Using Surrogate-Assisted Bayesian Inversion

11:30 - 11:55 **Sarah Quynh-Giang Ho**

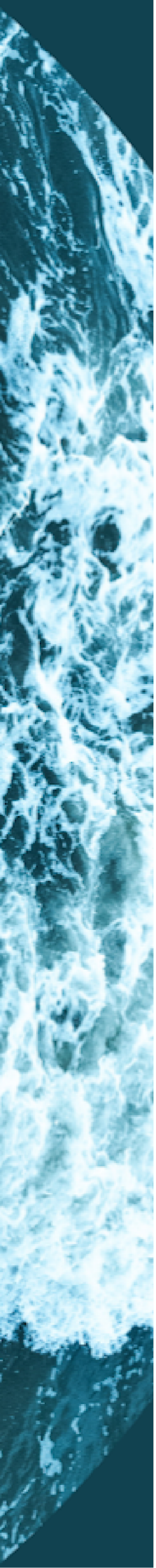
Characteristics and Effects of Flash and Traditional Drought: Case Study in the California Central Valley

11:55 - 12:20 **Dan Trinh Cong**

Evaluating the Drag Resistance and Wave Dissipation of Pile Group Breakwaters

12:20 - 12:45 **Michele Trevisson**

Fine-Sediment Erosion in Immobile Coarse-Grained Beds

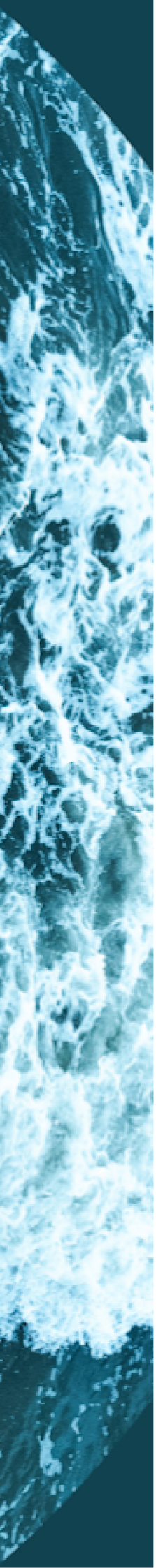


Hybrid Rainfall-Runoff Models

Manuel Álvarez Chaves
PhD student at Universität Stuttgart

A rainfall-runoff model is a simplified representation of a real-world system that aids in understanding, predicting and managing water resources. To be able to model these systems, one needs to consider multiple subdomains often described on different spatial and temporal scales. These subsystems are often highly complex.

In this talk several models for rainfall-runoff prediction will be shown with an emphasis on those which combine physics-based and data-driven approaches. Key aspects which guide model development are realism, explicit accounting of uncertainty, robustness, flexibility, computational efficiency, and out-of-sample performance. In addition, concepts from information theory (information entropy, cross entropy, mutual information) will be shown as model agnostic diagnostic tools.

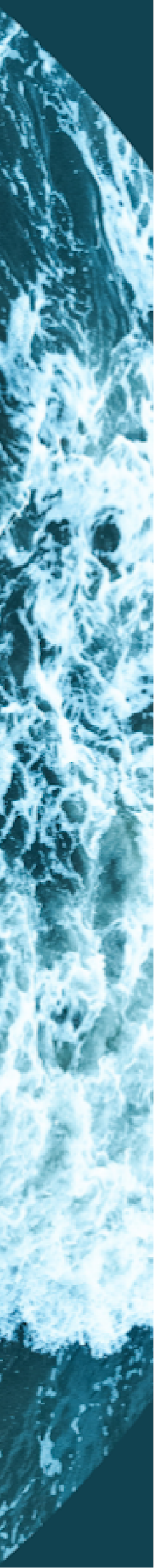


Stochastic Calibration of Sediment Transport Models Using Surrogate-Assisted Bayesian Inversion

Eduardo Acuña
PhD student at KIT

This talk deals with an analogous method to perform a stochastic calibration of a hydromorphodynamic model using surrogate-assisted Bayesian inversion. This method employs the connection between information theory and Bayesian Inference given by Oladyshkin and Nowak (2019) to localize relevant areas in the parameter space for surrogate training, and "adaptively improves the surrogate model in those regions of the parameter space that are most important for Bayesian inference, while including relevant information in an iterative manner" (Oladyshkin et al., 2020).

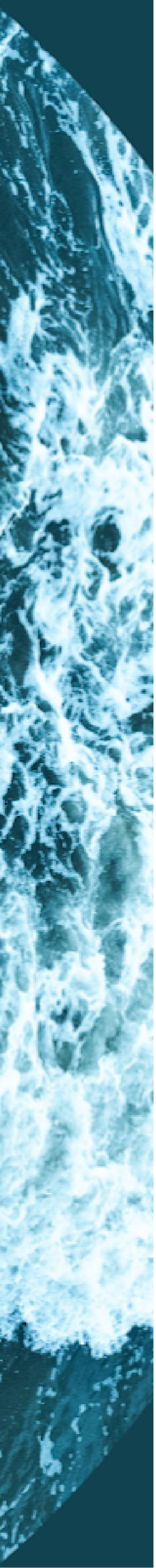
The calibration procedure is applied to a 2D reservoir sedimentation model, taking into account unsteady state transport of suspended sediments over a three-year period. The idea is to evaluate the advantages and drawbacks of the technique when applied to a complex, non-linear, computationally expensive model, with scarce information about the calibration parameters.



Characteristics and Effects of Flash and Traditional Drought: Case Study in the California Central Valley

Sarah Quynh-Giang Ho
PhD student at KIT

Despite rapid progress in the burgeoning field of flash drought research, few studies directly compare the differences in characteristics between flash drought (commonly understood as quick, rapid-onset drought) and traditional, slow-moving drought, particularly over agricultural regions where the effects may be the most disastrous. In this study, flash and traditional (normal) drought events are identified using soil moisture in the data-rich agricultural region of the California Central Valley for investigation of characteristics related to agriculture, namely the relative duration of drought events, the correlation with vegetation condition, the impact of aridity, and the differences in them between rainfed and irrigated agriculture. Overall, there are considerable differences between flash and normal drought, particularly in their spatial distributions and impacts due to aridity. Flash droughts even indicate a counterintuitive improvement in vegetation condition in the northern, more humid regions. Results also indicate slight improvements in drought conditions for irrigated land over rainfed, highlighting the importance of irrigation as a drought protection strategy in agriculture.



Evaluating the Drag Resistance and Wave Dissipation of Pile Group Breakwaters

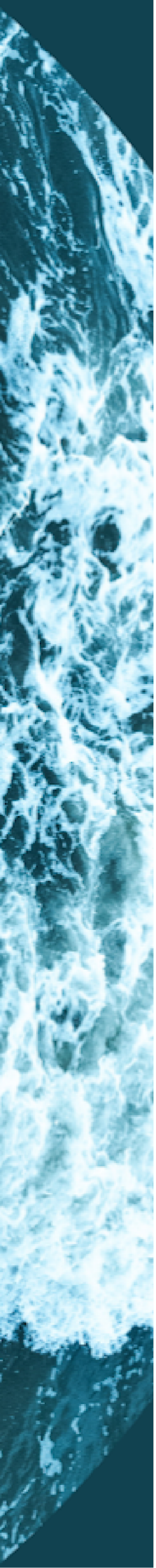
Dan Trinh Cong

PhD student at KIT

Vietnam Mekong delta is one of the most vulnerable region due climate change and sea level rise. Sediment deficiency, amplified by land subsidence, are creating a widespread problem of bank erosion on coastal shoreline.

Conventional breakwater like rubber mound or caisson are deemed to be too expensive and unideal for the region due to high demand of outsider building material and foundation treatment. Therefore, the new concepts of breakwater need to be light and porous, while efficient in cutting down incoming wave energy.

Groups of solid piles inspired by the functionality of mangrove root are put together to create a porous breakwater structure. The concept was tested against different conditions of wave by varying their height, period, wave steepness, etc. At the same time, pile's shape and the group arrangement are tweaked to evaluate the impact factor of each parameter in both physical and numerical wave tanks. The higher density of pile arrangement increases the damping effectiveness of the breakwater. However, it also increased reflection wave which proved to promote scour hole development in front of the structure. Different shape of pile acting differently on wave dissipation and could be utilized to fine-tune the overall efficiency of the breakwater.



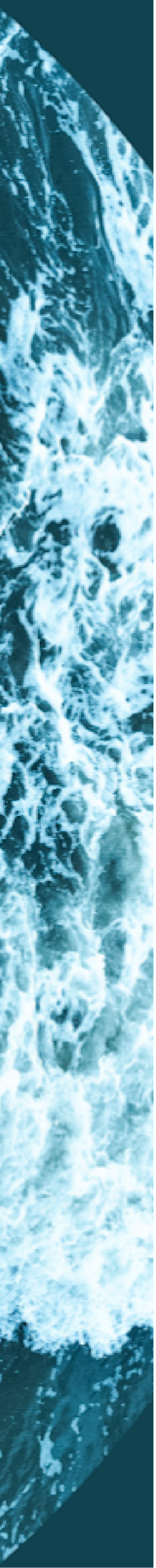
Fine-Sediment Erosion in Immobile Coarse-Grained Beds

Michele Trevisson

Postdoc at KIT

Sand-gravel bed rivers are characterized by the presence of fine mobile sediments being transported over a layer of coarser sediments immobile for most of the flow conditions. The immobile bed matrix of these rivers, composed by gravel, represents an important aquatic habitat providing, for example, spawning sites for fishes. These habitats can be greatly endangered though by the temporary increase of fine-sediment supply (e.g. by landslides) leading to river-bed clogging (Wharton et al., 2017). For the restoration of these aquatic habitats, accurate prediction of fine-sediment transport over coarse gravel beds is thus needed. This is particularly challenging as the presence of immobile gravel can increase or decrease the erosion of the fine sediments depending on the grade of exposure of the immobile grains (Nickling and Neuman, 1995; Grams and Wilcock, 2007; Yager et al., 2007). These two competing effects along with the hydrodynamic processes involved are still not well understood though.

This presentation deals with a flume experiment was conducted to investigate the erosion of an initially uniform fine-sediment bed covering an immobile bed of staggered spheres (2 cm in diameter), used to model gravel.



Professional's Forum

14:20 - 15:00 **Dr.-Ing. Ulrike Scherer**
The Water Research Network Baden-Württemberg – Interdisciplinary Approaches to Challenges in Water Research

15:00 - 15:40 **Mr Phillip Thumser**
Defining Sustainable Water Use in Context of Environmental Protection, Climate Change, Klimawende and Country Development – Examples from Europe, Africa and Asia

16:20 - 17:00 **Prof. Dr. Mário Franca**
Water Sciences and Engineering: Future by Design

17:00 - 17:40 **Dr.-Ing. Rüdiger Siebel**
Energy Generation Through Hydropower – Most Notably Renewable

The Water Research Network Baden-Württemberg – Interdisciplinary Approaches to Challenges in Water Research

Dr.-Ing. Ulrike Scherer

Scientific Manager for Water Research, Karlsruhe Institute of Technology

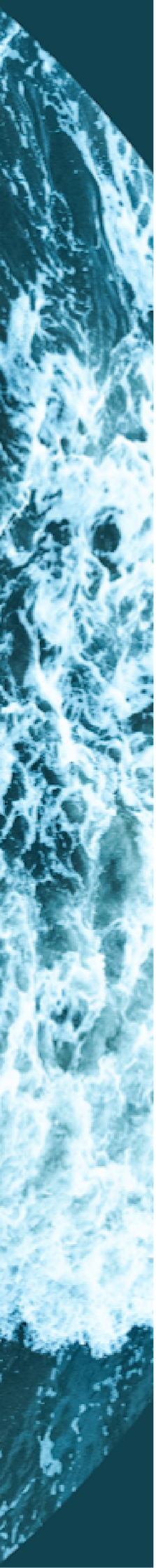
Ulrike Scherer is a scientific manager for water research at Karlsruhe Institute of Technology. Since 2015 she coordinates the Water Research Network Baden-Württemberg, an interdisciplinary network aiming to enhance the collaboration among universities in Baden-Württemberg. She studied geosciences and did a PhD in hydrology. Her scientific background comprises hydrological modelling, erosion processes and contaminant emissions in river basins.

Defining Sustainable Water Use in Context of Environmental Protection, Climate Change, Klimawende and Country Development – Examples from Europe, Africa and Asia

Mr Phillip Thumser

Co-founder & Manager of I Am Hydro GmbH

Mr. Thumser graduated from TU Dresden with a MSc in hydrology. After 2 years in Norway, he founded his own Consulting Company, I AM HYDRO (Investigation and monitoring of Hydrosystems) in 2013. In the past years he has been working in the fields of water resources management, hydrology, hydraulics (especially ecohydraulics) and river morphology. Even though many projects included modelling and planning, he



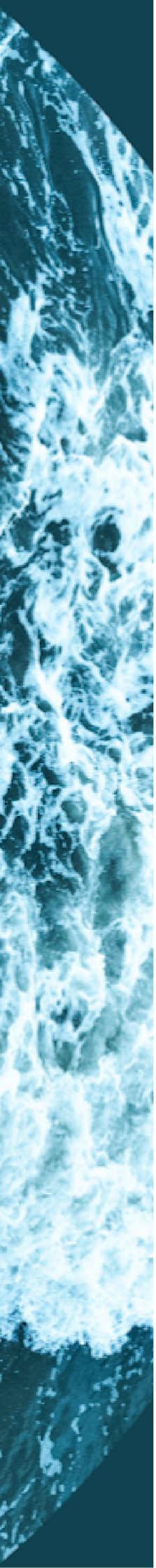
has a strong background on on-ground experience, especially in the Nile basin area, where he is since 2017 involved in several projects, including 3 hydrological and hydraulic field studies on the Nile River, covering several hundred river kilometers and a hydrological measurement campaign in Rwanda in the Akagera river catchmentIn the past 10 years, he has lead or participated in hydrological and water resource management projects in more than 70 river systems worldwide, including rivers outside Europe in Bhutan, Malaysia, India, Indonesia, Kyrgyzstan, Rwanda, South Sudan, Thailand, Tajikistan and Uzbekistan. Besides Consultancy, he also regularly teaches and supervises Bachelor and Master Thesis at University. He also holds a position as industrial supervisor at the Center for Biorobotics in Tallinn.

Water Sciences and Engineering: Future by Design

Prof. Dr. Mário Franca

Professor of Hydraulic Engineering and Water Resources Management, Karlsruhe Institute of Technology

Mário Franca holds a Docteur ès Sciences degree in Fluvial Hydraulics/Fluid Mechanics from the École polytechnique fédérale de Lausanne, Switzerland, and currently he is Professor of Hydraulic Engineering and Water Resources Management at the Karlsruhe Institute of Technology. He is also Professor of Hydraulic Engineering for River Basin Development at the Delft University of Technology, in the Netherlands, and before joining KIT he held academic positions at IHE Delft, EPFLausanne, New University of Lisbon and University of Coimbra.



He has dedicated his research efforts mainly on studying the mechanics of flowing water and its interactions with riverine non-organic, organic and anthropic elements.He also developed research on non-conventional hydropower production. He is regular consultant in hydraulic engineering, having participated and directed applied projects on dams, hydropower, water supply, river engineering, emergency planning for natural and dam break floods and safety of hydraulic infrastructures. He is part of the leading teams of the IAHR section on Fluvial Hydraulics and he is associate editor of Water Resources Research (AGU).

Energy Generation Through Hydropower – Most Notably Renewable

Dr.-Ing. Rüdiger Siebel

Department Head Hydropower Planning & Geomatics, Tractebel Engineering GmbH

Dr.-Ing. Rüdiger Siebel is a Senior Civil Engineer with depth knowledge in the fields of hydropower planning, hydraulic and geotechnical engineering, tunnelling, numerical seepage simulations, structural design, cost estimation, and site supervision. Furthermore, he is experienced in project management, contracts administration, mainly related to scheduling, programming, progress and cost control, and reporting. Skilled in report writing and the preparation of tender documents. He is also an experienced project manager used to lead teams of various experts, and possesses high communication skills and is amenable for all kinds of cultures.